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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/675,181	09/30/2003	Michel Betancourt	RSW920030180US1 (120)	5912
46320	7590	02/10/2006	EXAMINER	
CHRISTOPHER & WEISBERG, PA 200 E. LAS OLAS BLVD SUITE 2040 FT LAUDERDALE, FL 33301			CAMPOS, YAIMA	
			ART UNIT	PAPER NUMBER
			2185	

DATE MAILED: 02/10/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

**Office Action Summary**

Application No.

10/675,181

Applicant(s)

BETANCOURT ET AL.

Examiner

Yaima Campos

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☐ Responsive to communication(s) filed on 30 September 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-16 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-16 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 9/30/03 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date 3/3/05.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other: \_\_\_\_\_.

### **DETAILED ACTION**

1. The instant application having Application No. 10,675,181 has a total of 16 claims pending in the application; there are 4 independent claims and 12 dependent claims, all of which are ready for examination by the examiner.

#### **I. INFORMATION CONCERNING OATH/DECLARATION**

##### **Oath/Declaration**

2. The applicant's oath/declaration has been reviewed by the examiner and is found to conform to the requirements prescribed in 37 C.F.R. 1.63.

#### **II. INFORMATION CONCERNING DRAWINGS**

##### **Drawings**

3. The applicant's drawings submitted are acceptable for examination purposes.

#### **III. ACKNOWLEDGEMENT OF REFERENCES CITED BY APPLICANT**

4. As required by M.P.E.P. 609(C), the applicant's submission of the Information Disclosure Statement dated March 3, 2005 is acknowledged by the examiner and the cited references have been considered in the examination of the claims now pending. As required by M.P.E.P 609 C(2), a copy of the PTOL-1449 initialed and dated by the examiner is attached to the instant office action.

**IV. REJECTIONS BASED ON PRIOR ART**

**Claim Rejections - 35 USC § 102**

5. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

6. **Claims 1, 3-4, 6, 8, 10, 12-13 and 15** are rejected under 35 U.S.C. 102(b) as being anticipated by Menon et al. (US 5,933,840).

7. As per **claim 1**, Menon discloses “An autonomic memory leak detection and remediation system” as [**“garbage collection of segments in a log-structured storage system” (Column 1, lines 10-11). Menon also explains that “superseded data is referred to as garbage (or dead) and the corresponding disk area is referred to as a garbage block” (Column 3, lines 29-31)**] “comprising: an autonomic garbage collector coupled to memory configured to store object instances which can be accessed by executing processes and which can be referenced by other object instances in said memory;” [**With respect to this limitation, Menon discloses, “processor 102 or host computer that communicates with an external information storage system 104 having N+1 direct access storage devices (DASD)” wherein “control unit 108 manages the transfer of data to and from the DASD array 106 so that periodically it considers segments for garbage collection” (Figure 1 and Column 6, lines 15-18 and 28-33)**] “a tracing policy coupled to said autonomic garbage collector, said tracing policy specifying an aging threshold for a number of garbage collection passes during which an object instance in said memory is considered a loiterer when said object instance had not been accessed by one of said

executing processes” [Menon discloses this limitation as “segments must wait in the DASD array for a minimum time equal to an age threshold before they can be considered for garbage collection” (Column 9, lines 60-62) and further teaches that “the array controller 112 selects target segments for garbage collection only after the segments pass the age threshold value, and selects segment in the order of smallest utilization rate” (Figures 1 and 2 and Column 11, lines 15-18)].

8. As per claims 3 and 10, Menon discloses “An autonomic memory leak detection and remediation method” as [“garbage collection of segments in a log-structured storage system” (Column 1, lines 10-11); explains that “superseded data is referred to as garbage (or dead) and the corresponding disk area is referred to as a garbage block” (Column 3, lines 29-31)]. Menon also teaches modifying a mark and sweep garbage collection as [a garbage collection method which is analogous to “marking” objects for garbage collection and later “sweeping” or collecting these objects as the system “considers a segment for garbage collection only after the segment has been located in DASD for the selected age threshold value” (Column 5, lines 28-30) as marking segments for garbage collection. Menon also disclose that “after the segments pass the age threshold value,” then “array controller 112” selects “segments in the order of smallest utilization rate” (Column 11, lines 15-18) as explaining that segments are later collected/swept] “managing aging values associated with object instances created in memory” as [“the age of a segment is determined with a time processor destage clock 132 that generates a timestamp value for a segment when that segment is filled in the memory segment buffer 128” (Column 10, lines 10-13)] “and, processing as loiterers selected ones of said object instances having aging values which exceed a

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predetermined threshold” [Menon discloses this limitation as “segments must wait in the DASD array for a minimum time equal to an age threshold before they can be considered for garbage collection” (Column 9, lines 60-62) and further teaches that “the array controller 112 selects target segments for garbage collection only after the segments pass the age threshold value, and selects segment in the order of smallest utilization rate” (Figures 1 and 2 and Column 11, lines 15-18). Additionally, in order to perform garbage collection, there must be some sort of marking or identification of sections of memory selected for garbage collection in order to later sweep or collect garbage].

9. As per claims 6 and 13, Menon discloses “A method for detecting and remediating a memory leak,” and “A machine readable storage having stored thereon a computer program for detecting and remediating a memory leak, the computer program comprising a routine set of instructions for causing the machine to perform the steps of:” as [“garbage collection of segments in a log-structured storage system” (Column 1, lines 10-11) and explains that “superseded data is referred to as garbage (or dead) and the corresponding disk area is referred to as a garbage block” (Column 3, lines 29-31). Menon also teaches that “the processor 102 includes one or more central processor units, such as a microprocessor, to execute programming instructions; random access memory (RAM) to contain application program instructions, system program instructions, and data; and an input/output controller to respond to read and write requests from executing applications” (Figure 1 and Column 6, lines 39-45)] “the method comprising the steps of: establishing an aging value for an object instance created in memory;” [With respect to this limitation, Menon discloses, “the age of a segment is determined with a time processor destage clock 132 that generates

a timestamp value for a segment when that segment is filled in the memory segment buffer 128" (Column 10, lines 10-13)] "resetting said aging value when said object instance is referenced by an executing process;" [Menon discloses this concept as "age-queue buckets" wherein segments are grouped into "buckets where each bucket covers a range of utilization values" which "are organized as first in first out (FIFO) queues" (Column 12, lines 15-21). Menon also explains moving segments "to a different bucket as its utilization changes" and that whenever a segment "passes the age threshold, it is removed from the waiting list and enters the tail of the appropriate bucket determined by utilization" (Column 12, lines 34-45)] "incrementing said aging value during a garbage collection pass when said object instance had not been referenced by an executing process since a previous garbage collection pass;" [With respect to this limitation, Menon discloses an equivalent process wherein "the age of a segment is defined as the difference between the current value of the destage clock and the timestamp of the segment itself. Therefore, GC-filled segment initially has an age equal to the age of the youngest segment that contributed tracks to it" (Column 10, lines 28-32); therefore, the age of a "GC-filled" segments would be incremented as a "clock is incremented" because the age of this segment would comprise a current time minus the timestamp value of the youngest segment in a GC-filled segment] "and, when said aging value exceeds a threshold value, processing said object instance as a loiterer" [Menon discloses this limitation as "segments must wait in the DASD array for a minimum time equal to an age threshold before they can be considered for garbage collection" (Column 9, lines 60-62) and further teaches that "the array controller 112 selects target segments for garbage collection only after the segments pass the age threshold

**value, and selects segment in the order of smallest utilization rate” (Figures 1 and 2 and Column 11, lines 15-18)].**

10. As per **claim 4**, Menon disclose “The system of claim 1,” [See rejection to claim 1 above] “wherein said tracing policy further comprises a specification for at least one action to be undertaken upon detecting a loiterer” [With respect to this limitation, Menon discloses “**the array controller 112 selects target segments for garbage collection only after the segments pass the age threshold value, and selects segment in the order of smallest utilization rate” (Figures 1 and 2 and Column 11, lines 15-18) as “garbage collecting” segments that are identified as “loiterers”**].

11. As per **claims 8, 12 and 15**, Menon discloses “The method of claim 6,” [See rejection to claim 6 above] “wherein said processing step comprises at least one of clearing at least one cache in memory,” [With respect to this limitation, Menon discloses “**Non-volatile LRU managed cache 118” (Figure 1) and explains using a cache as “the LSA control unit 108 of the preferred embodiment includes both a non-volatile LSA data cache 118 and a memory segment buffer 128” (Column 8, lines 55-57)] “and reporting said object instance as a loiterer in a log file” [Menon discloses an analogous concept as “age-queue buckets” wherein segments are grouped into “buckets where each bucket covers a range of utilization values” which “are organized as first in first out (FIFO) queues” (Column 12, lines 15-21). Menon also explains moving segments “to a different bucket as its utilization changes” and that whenever a segment “passes the age threshold, it is removed from the waiting list and enters the tail of the appropriate bucket determined by utilization” (Column 12, lines 34-45) as having queue logs of items selected for garbage collection].**



**Claim Rejections - 35 USC § 103**

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. **Claims 2, 5, 9, 11 and 16** are rejected under 35 U.S.C. 103(a) as being unpatentable over Menon et al. (US 5,933,840) in view of Ozawa et al. (US 2001/0023478).

14. As per **claim 2**, Menon discloses “The system of claim 1,” [See rejection to claim 1 above] “wherein said memory managed through a virtual machine” [With respect to this limitation, Menon teaches “In this way, one or more logical (virtual) devices are mapped onto the actual DASDs of the array 106 by the array control unit 108” (Column 9, lines 41-45)] but fails to disclose expressly that “said memory is a heap”.

Ozawa discloses a garbage collection method/system wherein a heap memory is analyzed for garbage collection as [“a sweep phase, the entire heap is scanned and unmarked cells are collected” wherein “a mark phase and a sweep phase are alternately repeated” in a “mark and sweep” garbage collection method (Column 1, paragraph 0017)].

Menon et al. (US 5,933,840) and Ozawa et al. (US 2001/0023478) are analogous art because they are form the same field of endeavor of garbage collection.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine the garbage collection system which uses age of objects and usage information for selecting objects for garbage collection as taught by Menon wherein memory is

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managed through a virtual machine and further perform this garbage collection on a heap as taught by Ozawa.

The motivation for doing so would have been because Ozawa teaches that [**“in the description of garbage collection, a memory resource to be managed is called a heap” wherein “the heap is composed of units of data strings called cells (of objects). Each cell can include pointers pointing to another cell and another data” and explains that “the number of pointers to be reported to the memory management unit can be reduced, and a process load can be reduced accordingly” (Column 3, paragraph 0040) when using a heap**].

Therefore, it would have been obvious to combine Ozawa et al. (US 2001/0023478) with Menon et al. (US 5,933,840) for the benefit of creating a garbage collection system/method to obtain the invention as specified in claim 2.

15. As per **claims 5, 9, 11 and 16**, Menon discloses “The system of claim 1,” [See rejection to claim 1 above] but does not disclose expressly “listing of exempt classes based upon which object instances are exempted from being labeled loiterers.”

Ozawa discloses the concept of “listing of exempt classes based upon which object instances are exempted from being labeled loiterers” as [**“cells are marked in three colors: white, black and off-white” and “white-marked cells can be judged to be *garbage* and black-marked cells cannot be judged to be *garbage*. In the sweep phase of PMGC, only white marked cells are collected” (Column 7, paragraph 00153)**].

Menon et al. (US 5,933,840) in view of Ozawa et al. (US 2001/0023478) are analogous art because they are form the same field of endeavor of garbage collection.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine the garbage collection system which uses age of objects and usage information as taught by Menon and further exclude certain memory sections from being collected as garbage by marking them as “exempt” as taught by Ozawa.

The motivation for doing so would have been because Ozawa teaches that excluding certain memory sections from being collected as garbage by marking them as “exempt” [solves “the problem that the live cells are collected by mistake” (Column 2, paragraph 0026) as “roots” are protected from being collected as garbage (Columns 1-2, paragraph 0019). Ozawa also teaches that “the number of pointers to be reported to the memory management unit can be reduced, and a process load can be reduced accordingly” (Column 3, paragraph 0040)].

Therefore, it would have been obvious to combine Ozawa et al. (US 2001/0023478) with Menon et al. (US 5,933,840) for the benefit of creating a garbage collection system/method to obtain the invention as specified in claims 5, 9 and 16.

16. **Claims 7 and 14** are rejected under 35 U.S.C. 103(a) as being unpatentable over Menon et al. (US 5,933,840) in view of Chakraborty et al. (US 2002/0165870).

17. As per **claims 7 and 14**, Menon discloses “The method of claim 6,” [See rejection to **claim 6 above**] but fails to disclose expressly “locating equivalent object instances in said memory; and, processing said equivalent object instances in said memory as loiterers.”

Chakraborty discloses “locating equivalent object instances in said memory; and, processing said equivalent object instances in said memory as loiterers” as [“**the most recently used time stamp for the repeated nodes becomes the time stamp for all of those nodes;**”

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**then “garbage collector creates an intermediate data structure” which “holds one entry for each repeated node. The least recently used of all entries in the intermediate data structure is chosen and then, all of those repeated entries in the node table are removed by the garbage collector” (Column 3, paragraph 0050, lines 3-12)].**

Menon et al. (US 5,933,840) and Chakraborty et al. (US 2002/0165870) are analogous art because they are form the same field of endeavor of garbage collection.

At the time of the invention it would have been obvious to a person of ordinary skill in the art to combine the garbage collection system which uses age of objects and usage information as taught by Menon and further process equivalent or repeated object instances as “loiterers” or garbage as taught by Chakraborty.

The motivation for doing so would have been because Chakraborty discloses that removing or garbage collecting repeated object instances allows the system to [**“reduce latency” and “reduce traffic” as multiple instances of the same object are removed from cache; therefore, since these object instances are “retrieved from a server once, it reduces the amount of bandwidth used by a client” (Column 2, paragraphs 0016-0018)].**

Therefore, it would have been obvious to combine Chakraborty et al. (US 2002/0165870) with Menon et al. (US 5,933,840) for the benefit of creating a garbage collection system/method to obtain the invention as specified in claims 7 and 14.

**V. RELEVANT ART CITED BY THE EXAMINER**

18. The following prior art made of record and not relied upon is cited to establish the level of skill in the applicant's art and those arts considered reasonably pertinent to applicant's disclosure. See **MPEP 707.05(c)**.

19. The following references teach garbage collection.

**U.S. PATENT NUMBER**

US 5,485,613

US 5,530,850

US 6,339,779

US 2003/0140071

US 5,845,298

US 5,241,673

US 4,989,134

US 2003/0191783

US 2002/0107879

US 6,434,575

US 6,871,272

**VI. CLOSING COMMENTS**

**Conclusion**

**a. STATUS OF CLAIMS IN THE APPLICATION**

20. The following is a summary of the treatment and status of all claims in the application as recommended by **M.P.E.P. 707.07(i)**:

**a(1) CLAIMS REJECTED IN THE APPLICATION**

21. Per the instant office action, claims 1-16 have received a first action on the merits and are subject of a first action non-final.

**b. DIRECTION OF FUTURE CORRESPONDENCES**

22. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Yaima Campos whose telephone number is (571) 272-1232. The examiner can normally be reached on Monday to Friday 8:30 AM to 5:00 PM.

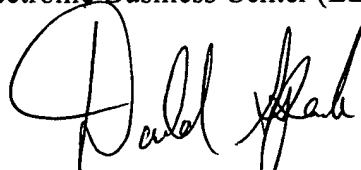
**IMPORTANT NOTE**

23. If attempts to reach the above noted Examiner by telephone are unsuccessful, the Examiner's supervisor, Mr. Donald Sparks, can be reached at the following telephone number: Area Code (571) 272-4201.

The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300. Information regarding the status of an application may be obtained

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from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



**DONALD SPARKS**  
**SUPERVISORY PATENT EXAMINER**

February 3, 2006

Yaima Campos  
Examiner  
Art Unit 2185